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Evaluation of clinical indicators and social context for developing lifestyle modification programs after gestational diabetes mellitus: a case study of a cohort of women in the Illawarra region, Australia

Janelle Barnard

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EVALUATION OF CLINICAL INDICATORS AND SOCIAL
CONTEXT FOR DEVELOPING LIFESTYLE MODIFICATION
PROGRAMS AFTER GESTATIONAL DIABETES MELLITUS:

A CASE STUDY OF A COHORT OF WOMEN IN THE
ILLAWARRA REGION, AUSTRALIA

A thesis submitted in fulfilment of the requirements for the award of the
degree

DOCTOR OF PHILOSOPHY

from

UNIVERSITY OF WOLLONGONG

by

JANELLE BARNARD, BBus CSU, BSc UOW, MSc UOW

SMART FOODS CENTRE
AND
DEPARTMENT OF BIOMEDICAL SCIENCES

University of Wollongong

2005

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Janelle Barnard

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CERTIFICATION

I, Janelle A. Barnard, declare that this thesis, submitted in partial fulfilment of the requirements for the award of Doctor of Philosophy, in the Department of Biomedical Sciences, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Janelle A. Barnard

25th February 2005

DEDICATION

This work is dedicated to the glory of God.

*He renews my strength.
He guides me along right paths
bringing honour to his name.
Psalm 23:3*

It is with your grace that I find myself in this place. It has ultimately been to you that I have turned when I have been disheartened and confused and you have blessed me with a way forward. Your strength has held me up. You have used me as your instrument to serve you, and reminded me to serve my brothers and sisters with love, honesty and respect. I humbly thank you.

*Don't worry about anything; instead pray about everything. Tell God what you need and thank him for all he has done. If you do this, you will experience God's peace, which is far more wonderful than the human mind can understand. His peace will guard your hearts and minds as you live in Jesus Christ.
Philippians 4:6-7*

God bless and peace be with you.

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To capture the complexity of family life and add to scientific debate on clinical intervention is a difficult but important task. It is my intention that this work will help to describe, understand and support women with previous gestational diabetes to be able to access programs that will allow them to enjoy greater health with their families. I thank all of those women and their support people who shared their time, bodies and experiences with me to assist in achieving this aim. It is my sincere wish that they are happy with this work and the way this snapshot of their lives has been presented.

PUBLICATIONS

Peer reviewed publications in support of this thesis

Barnard, JA, Tapsell, LC, Davies, PSW, Brenninger, VL, Storlien, LH (2002), Relationship of high energy expenditure and variation in dietary intake with reporting accuracy on 7 day food records and diet histories in a group of healthy adult volunteers. *European Journal of Clinical Nutrition*, 56, 358-67.

Presentations in support of this thesis

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LIST OF ABBREVIATIONS

7dFR	seven day food record
%BF	percentage body fat
%CV	coefficient of variation
AD	activity diary
BIA	bioelectrical impedance analysis
BMI	body mass index
BMR	basal metabolic rate
CVD	cardiovascular disease
DH	diet history
DHEA-S	dehydroepiandrosterone-sulphate
DLW	doubly labelled water
EE	energy expenditure
EE _{meas}	energy expenditure directly measured by doubly labelled water
EE _{pub}	energy expenditure indicated by published doubly labelled water
EE _Q	energy expenditure estimated by questionnaire
EI	energy intake
EI _{DH}	energy intake measured by diet history
EI _{rep}	reported energy intake
FAI	free androgen index
FFQ	food frequency questionnaire
FR	food record/s
FSH	follicle-stimulating hormone
GDM	gestational Diabetes Mellitus
HDL-C	HDL cholesterol
HOMA	Homeostatic Model Assessment
HOMA-%B	β-cell function assessed by Homeostatic Model Assessment
HOMA-%S	insulin sensitivity assessed by Homeostatic Model Assessment
HOMA-IR	insulin resistance assessed by Homeostatic Model Assessment
IFG	impaired fasting glucose

IGT	impaired glucose tolerance
LDL-C	LDL cholesterol
LH	luteinising hormone
LHQ	Lifestyle History Questionnaire
MAQ	Modifiable Activity Questionnaire
MET	metabolic equivalent
MUFA	monounsaturated fatty acids
n-3	omega-3 fat/fatty acids
n-6	omega-6 fat/fatty acids
OGTT	oral glucose tolerance test
PAL	physical activity level
PCOS	polycystic ovary syndrome
P:S	polyunsaturated to saturated fatty acid ratio
PUFA	polyunsaturated fatty acids
SFA	saturated fatty acids
SHBG	sex hormone binding globulin
T1DM	type 1 diabetes mellitus
T2DM	type 2 diabetes mellitus
TC	total cholesterol
TEE	total energy expenditure
TEF	thermic effect of food
VLCn3	very long chain omega-3 fatty acids
WHO	World Health Organisation

ABSTRACT

Women with previous gestational diabetes mellitus (GDM) have a 30-50% future risk of developing Type 2 diabetes mellitus (T2DM), a global public health problem. Preventive approaches would target diet and physical activity behaviours yet little is known about these lifestyle parameters in this group. This thesis describes the diet, physical activity and risk factor profile of a sample of women with previous GDM from the Illawarra region of New South Wales, Australia. A comprehensive ethnographic description is created profiling the sample using both quantitative (surveys, diet and physical activity measurements and clinical assessments) and qualitative techniques (in depth interviews). The central hypothesis is that, while the need for diet and physical intervention may be clearly demonstrated in this group of women, the complexities of their lives needs to be considered when developing how these interventions might be delivered.

It is reasonable to assume that providing interventions for women with small children may pose practical and social challenges that warrant consideration in program design. The main aim of the research was therefore to assess the extent of the need for intervention for an identifiable cohort of women and qualify this with an in-depth analysis of these practical and social issues. Subjects were recruited from the database of women referred to the Illawarra Diabetes Service who would be 10-25 months post-partum at the time of the study. Of a potential 150 subjects, 52 were accessible and completed a telephone interview, 19 completed a more in-depth cross-sectional survey, and 21 completed in-depth interviews with a further ten "support" people recruited through a snowballing technique. The health profile of the subjects confirmed the need for diet and activity intervention. Ten of 18 women completing a standard glucose tolerance test produced an abnormal result and were advised to seek further medical care. Dietary intake patterns were not in keeping with current recommendations for the prevention of T2DM (total fat $34.9 \pm 7.7\%$, SFA $13.2 \pm 4.0\%$, PUFA $5.5 \pm 1.7\%$ compared to targets of $<30\%$, $<10\%$ and $>10\%$ respectively). While 16 of 19

women met physical activity guidelines, the research indicated that further work on the nature of physical activity in this group warrants consideration and that current, more general physical activity guidelines for the prevention of T2DM be adapted for this group. Most of the women (47 out of 51) initially expressed an interest in lifestyle programs but indicated that time and childcare barriers would prevail. In-depth interviews indicated that there were differences between women in relation to the potential accessibility of lifestyle intervention programs and that this may rest on feelings of empowerment within the limited capacity of family systems. Opportunities for lifestyle intervention in healthcare services are likely to lie within a model of family-centred therapy. This acknowledges that the lives of these women are embedded in an interdependent network of individuals forming the family system.